

# MARSHALL STAR

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## Space Launch System Providing Engine 'Brains' with an Upgrade

By Bill Hubscher

America's next heavy-lift rocket needs a strong and reliable engine to launch humans beyond low Earth orbit. That's why engineers with NASA's Space Launch System Program, managed at the Marshall Space Flight Center, will use the proven RS-25, the space shuttle's main engine during its 30-year history, to power the massive rocket's core stage. The RS-25, which was designed and developed with NASA by Pratt & Whitney Rocketdyne, is a crucial part to the core stage design, but a few enhancements are planned.



**Image right:** During a recent tour for Space Launch System Program managers, Mike Kynard, center, manager of the program's Engines element office, explains how test personnel use working parts from an RS-25 engine to test the new engine control unit at the Marshall Space Flight Center test facilities. (NASA/MSFC)

While the RS-25 engines launched 135 missions, it needs a new "brain" to drive the 3.5-ton engine.

"The computer controlling the SSME was manufactured in the early '80s and many parts are now obsolete," said Jeremy Richard, SLS Liquid Engines Office Subsystem manager. "While working on updating the technology, we discovered we could adapt the same controller being used by the new J-2X engine to the RS-25 engine, effectively streamlining the controller and resulting in a cost savings."

The role of an engine controller unit is to allow communication between the vehicle and the engine, sending commands down to the engine and transmitting data back to the vehicle. The controller also provides closed loop management of the engine by regulating thrust and fuel mixture ratio while monitoring the engine's health and status.

"Our long-term objective is to use the same basic hardware design to control multiple engines," Richard said. "With a common physical design and just a few card change outs, we could control the RS-25, J-2X, and future engine designs at less than half the cost of a space shuttle main engine controller."

Engineers with Pratt & Whitney Rocketdyne are hard at work on the J-2X engine control unit in Building 4436 at the Marshall Center. The J-2X will power the upper stage of the evolved heavy-lift rocket, capable of lifting 130 metric tons beyond low Earth orbit.

Meanwhile, in a separate room barely 20 feet away, the same controller with a few minor alterations is undergoing rigorous testing for the RS-25. This room houses equipment to simulate the engine in flight, using real RS-25 actuators, connectors and harnesses.

SLS engineers will spend the coming year fine-tuning the design and testing the controller unit at the Marshall Center. Once they have a proven lab-tested version, the controller will be moved to the Stennis Space Center for hot-fire testing in 2014.

Building on an established infrastructure but with a modern design, the ultimate goal is a universal rocket engine controller.

For a closer look at a recent test of the RS-25 engine controller unit, visit:

[http://www.nasa.gov/multimedia/videogallery/index.html?media\\_id=154074051](http://www.nasa.gov/multimedia/videogallery/index.html?media_id=154074051)

*Hubscher, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.*

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## Marshall Team Members Encouraged to 'Find Your Passion' at CFC Rally



*The Marshall Space Flight Center kicked off its 2012 Combined Federal Campaign -- the center's annual charitable drive -- with a spirited rally Oct. 10 in Activities Building 4316. The theme for this year's campaign is "Find Your Passion." Representatives from numerous nonprofit organizations at the event talked with team members about how their services -- made possible with CFC contributions -- help the community. Newly appointed Marshall Center Director Patrick Scheuermann, left, greets a representative from The Arts Council Inc., whose mission is to advance the arts to enrich the quality of life, economic development*

and education of the greater Huntsville and Madison County community. Marshall team members may find more information on this and other charitable organizations on the [CFC ExplorNet page](#). (NASA/MSFC/Emmett Given)

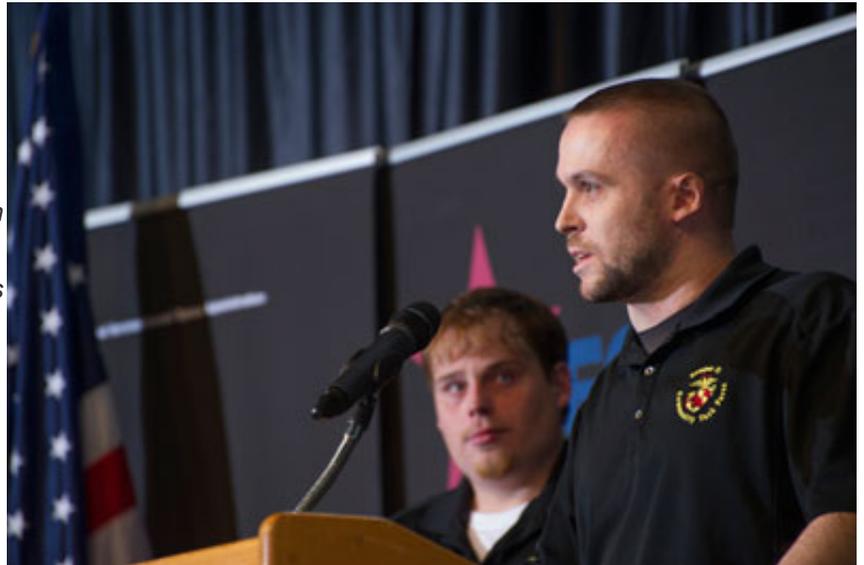
The reigning Miss Alabama, Anna Laura Bryan, spoke to CFC rally goers about the importance of giving, and about autism awareness, her pageant platform. Bryan founded Paws for Autism, an organization whose mission is to help the families of children with autism connect to the world through the use of service dogs. In 2011, a bill she initiated was signed into Alabama law to allow autistic children to take their therapy dogs to school. (NASA/MSFC/Emmett Given)





The U.S. Army Materiel Command Band played tunes and sang a patriotic song during the CFC rally. Miss Alabama, Anna Laura Bryan, also sang two songs including the hymn, "How Great Thou Art," and received a standing ovation. Marshall team members can watch a video of the CFC program on [ExplorNet](#). (NASA/MSFC/Emmett Given)

James West, at the podium, and Brandon Johnson, left, both soldiers who were severely wounded during active military duty, shared their stories of hope and how the organization, the Wounded Warrior Project, which receives funding from CFC contributions, is helping them through their recoveries. The Wounded Warrior Project raises awareness and provides services to injured military service members. West and Johnson also are supported by the Still Serving Veterans and the Semper Fi Community Task Force, CFC-aided local organizations that help wounded soldiers. (NASA/MSFC/Emmett Given)



Following the CFC program, Marshall retiree Inge Kuberg, right, hands out sweet treats -- provided by Costco of Huntsville. Those who attended the event also enjoyed a hot dog lunch, compliments of Redstone Federal Credit Union, and frozen goodies donated by Purity Ice Cream Company. (NASA/MSFC/Emmett Given)

Julie Clift, center, an education program specialist in Marshall's Academic Affairs Office, pats a dog that works with its handler to support the mission of Therapy Partners Inc. of Huntsville. The organization provides professionally trained and certified teams of handlers and animals to work as a therapeutic tool in hospitals, schools, long-term care facilities and other appropriate settings. (NASA/MSFC/Emmett Given)



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## Breast Cancer Survivor Cindy Stemple: 'Early Detection Saved My Life'

By Megan Davidson



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Marshall Space Flight Center engineer Cindy Stemple didn't just beat breast cancer once -- she beat it twice.

**Image left: Cindy Stemple, center, a two-time breast cancer survivor and advocate, works to raise awareness about the disease at the Oct. 11 Breast Cancer Awareness Month event at Marshall. Also helping with the cause is Donna Mahieux, left, a program analyst in Marshall's Materials & Processes Laboratory. Mahieux has been cancer-free since 2010. Tricia Motts, right, is an eight-year breast cancer survivor and a Science Applications International Corp. employee supporting the Office of the Chief Information Officer. (NASA/MSFC/Fred**

Stemple, acting deputy project manager for the Robotic Lander Development Project at the Marshall Center, was just 38 years old when she was diagnosed with breast cancer in March 2002. "I felt something that just didn't feel normal, so I went to the doctor," Stemple said. "A week and half later, I was diagnosed with stage one breast cancer. I had a physical just five months before, with a clean baseline mammogram. I had no history of the disease in my family, and I was very active and lived a healthy lifestyle. Needless to say, I was shocked.

"My greatest concerns were for my husband, Dan, and our three children, who were 3, 9 and 10 years old at the time," she reflected. "I knew we had a long few months ahead with my treatment, and being their mother, I wanted to protect them from any pain or heavy burden related to my diagnosis."

The next four months for Stemple were filled with surgery, chemotherapy and radiation treatments. The treatments made

her extremely fatigued, and she lost all of her hair -- a common side effect of chemotherapy. "My youngest child said I looked like a baby, which actually made me happy because I thought he would be afraid of me," Stemple said.

"Some days were really difficult, especially when I didn't have the energy to do things with my kids," she added. "But I had lots of help from my husband, family, church members, friends and coworkers at Marshall. They have all blessed me with their never-ending support. That support, along with my faith, helped me take my cancer battle one day at a time."

Stemple finished her treatment and returned to work full time in July 2002 as a software developer in Marshall's Microgravity Development Laboratory. She continued diligent medical checkups, but in December 2003 -- just 17 months after her original diagnosis -- a mammogram and biopsy showed a reoccurrence of breast cancer. "It knocked the wind out of me," Stemple said. "But I remained hopeful, and my faith again gave me the strength to go through another round of treatment."

She underwent a second surgery, but since the cancer was detected early, Stemple didn't have to go through radiation and chemotherapy a second time. She's now a 10-year, two-time survivor, and has become an advocate for breast cancer awareness. She and Patty Montgomery, a computer engineer in Marshall's Mission Operations Laboratory, are co-chairs of the Marshall Center's Breast Cancer Awareness group, whose members recently set up a table in Building 4203 to answer questions and hand out American Cancer Society pamphlets and goodies. Stemple also is chairwoman of the board of directors of the Huntsville chapter of the Bosom Buddies, a group dedicated to cancer education and survivorship. She recently was named an American Cancer Society "Hero of Hope," serving as an ambassador for the nonprofit organization.



"Early detection saved my life," Stemple said. "I hope my experience encourages women, and men, to be vigilant and knowledgeable about cancer screening guidelines and to be sure to have regular mammograms and checkups. The five-year survival rate is 98 percent when cancer is detected early."

To celebrate 10 years as a survivor, Stemple is training for a half-marathon, to be held Nov. 3 in Savannah, Ga. She is grateful to be healthy enough to accomplish one of her dreams, but most importantly, to continue to be a wife and mother.

"I am so encouraged that there are two million breast cancer survivors in the United States," Stemple said. "When I was first diagnosed in 2002, I was so hopeful for what the future would hold, hopeful to spend time with my family and to be a part of all their special milestones in life. And I have been there through so many of those in the last 10 years. My husband and I are enjoying growing old together. I'm thankful for each day and encouraged that one day, there will be a cure for cancer."

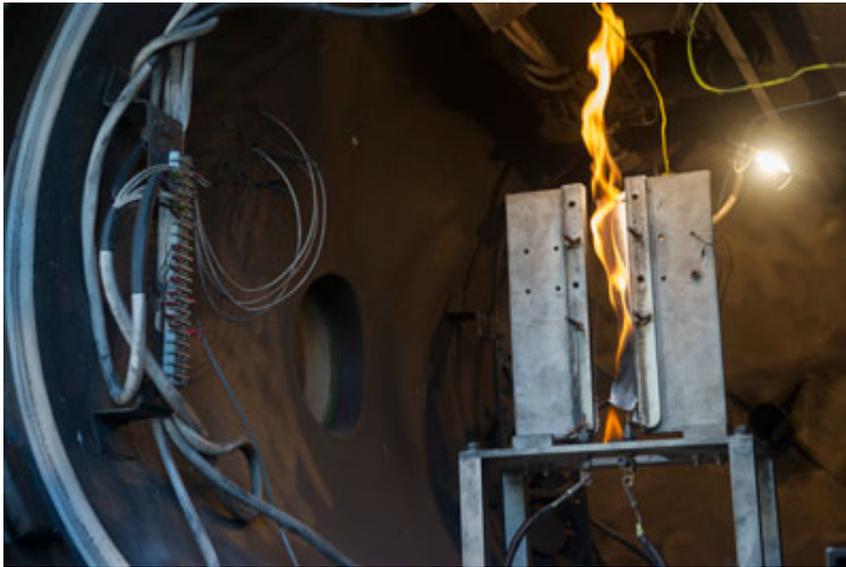
*Davidson, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.*

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## **Marshall Center Lighting the Match to Learning More about Fires in Space**

*By Megan Davidson*



Fast forward. A crew of astronauts is on its way to explore the red depths of Mars. A piece of equipment catches fire along the journey. What's the best way for astronauts to quickly extinguish that fire in conditions beyond low Earth orbit? Or avoid a fire even starting?

***Image left: During a combustion demonstration test, a sample material is set on fire for 30 seconds in a large chamber, filled with varying pressure levels of nitrogen and oxygen. Data, including the maximum oxygen concentration at which a propagating flame will go out, is collected while the samples are kindled for 30 seconds. The test data will be important in the design of a future, large-scale fire***

***experiment in space. (NASA/MSFC/Emmett Given)***

Engineers at the Marshall Space Flight Center are hoping to answer those questions -- and many others -- through a series of tests and studies being conducted at Marshall and four other NASA facilities -- Glenn Research Center, the lead center for the project; Johnson Space Center; the Jet Propulsion Laboratory; and the White Sands Test Facility. The combined test data will be used to help design a future large-scale fire experiment in space.

The collaborative, three-year project is part of NASA's Advanced Exploration Systems, or AES, program -- pioneering new approaches for rapidly developing prototype systems, demonstrating key capabilities and validating operational concepts for future human missions beyond low Earth orbit. Advanced Exploration Systems activities are uniquely related to crew safety and mission operations in deep space, and are strongly coupled to future vehicle development.

"NASA has been interested in furthering our understanding of fires outside the Earth's atmosphere for quite some time," said Harry Wise, a Victory Solutions Inc. employee with the Jacob's Engineering and Science Services and Skills Augmentation contract, supporting Marshall's Materials & Processes Laboratory. Wise is a lead for the fire testing at Marshall. "We've always had the goal to do some fire safety studies and experiments to advance that capability, so we're excited to be part of this project," he said.

"Basically, our whole risk strategy for fire right now is based on low Earth orbit protocols. On the space shuttle, the astronauts could close the doors and come home if there were a fire event. With NASA's new exploration goals going beyond low Earth orbit, astronauts will need the means necessary to extinguish a fire quickly and safely. These experiments will help us learn more about various fire safety issues, including low-gravity material flammability, fire suppression and post-fire cleanup."

Marshall's piece of the puzzle is to recommend the best material to set aflame for the large-scale test. Hundreds of test samples have been narrowed down to seven different materials. Each material is put into a test chamber, filled with varying pressure levels of nitrogen and oxygen -- mimicking conditions aboard a spacecraft. Testing is being done at Marshall's Materials & Processes Laboratory.

***Image right: Erick Ordonez, a structural materials engineer at the Marshall Center, controls the levels of nitrogen and oxygen going into the chamber during a fire demonstration test. (NASA/MSFC/Emmett Given)***



Data, including the maximum oxygen concentration at which a propagating flame will go out, is collected while the samples are kindled with varying energies. Each sample is tested several ways, including being lit by different igniter types. The current plan is for one material to be chosen for the large-scale test. "We want to make sure the material for the test will be 100 percent flammable in an orbital environment," said Wise. Once the best two to three sample materials are determined, they will be sent to Glenn Research Center for further testing in a zero-gravity drop tower.

Marshall is also helping with the Burning and Suppression of Solids, or BASS II, feasibility study. BASS II would be a "big brother" to the BASS experiment, an existing fire-testing experiment being performed on the International Space Station. "The BASS experiment is similar to our current fire testing, but its capabilities are small compared to what we want to do," said Wise. "BASS material samples are about the size of a stick of gum. We want to provide larger materials for that experiment that burn longer, and ultimately, build a bigger, better BASS."

To learn more about NASA's AES Program, visit <http://www.nasa.gov/directorates/heo/aes/index.html>.

*Davidson, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.*

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**Colors Across the Sky: Watch the Orionids Meteor Shower and Talk to NASA Astronomers During Web Chat Oct. 20-21**

*By Janet Anderson*



On the night of Oct. 20-21, a team of astronomers from the Marshall Space Flight Center will take your questions about the Orionid meteor shower via a Web chat beginning at 10 p.m., continuing through 2 a.m.

***Image left: An amateur photographer, Rich Swanson of Sierra Vista, Ariz., caught an Orionid meteor streaming across the sky in October 2008. (Photo courtesy)***

#### **About the Orionids**

Orionids appear every year around this time when Earth orbits through an area of space littered with debris from the ancient comet.

Normally, the shower produces 20 or so meteors per hour. The past few years, however, have been much better than usual.

"Earth is passing through a stream of debris from Halley's Comet, the source of the Orionids," says Bill Cooke of lead of Marshall's Meteoroid Environment Office. "Flakes of comet dust hitting the atmosphere should give us dozens of meteors per hour."

The best time to look is before sunrise on Oct. 21. That's when Earth encounters the densest part of Halley's debris stream. Observing is easy. Wake up a few hours before dawn, go outside and look up. No telescope is required to see Orionids shooting across the sky.

"Since 2006, the Orionids have been one of the best showers of the year, with counts of 60 or more meteors per hour," says Cooke.

The phase of the moon favors a good show. The moon is almost new and completely absent from the pre-dawn sky at the time of the shower's peak. Bright moonlight will not be a problem.

The display will be framed by some of the prettiest stars and planets in the night sky. In addition to Orionids, you'll see brilliant Venus, red Mars, the Dog Star Sirius, and bright winter constellations such as Orion, Gemini and Taurus. Even if the shower is a dud, the rest of the sky is dynamite.

Set your alarm, brew some hot chocolate and enjoy the show!

*Anderson is a public affairs officer in the Office of Strategic Analysis & Communications.*

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**John Honeycutt Named Space Launch System Deputy Chief Engineer**

John Honeycutt has been appointed to the Senior Executive Service, or SES, position of deputy chief engineer for the Space Launch System Program at the Marshall Space Flight Center.

He will play a leading role in program planning and leadership, directly supporting and providing senior program management advice to the SLS program manager. Through delegation of the SLS chief engineer and the Marshall Center chief engineer, he will be responsible for leading overall engineering support to the SLS Program. The SES is the personnel system covering top managerial positions in approximately 75 federal agencies.

The Space Launch System is an advanced, heavy-lift launch vehicle allowing science and human exploration beyond Earth's orbit. Managed by the Marshall Center, SLS will give the nation a safe, affordable and sustainable means of reaching beyond our current limits and open new doors of discovery from the unique vantage point of space.

Before his recent appointment, Honeycutt was deputy manager of the Stages Element Office of the SLS, sharing responsibility, accountability and authority for the complete scope of activities associated with development and performance of the stages element. He was responsible for partnering with the project manager in leading the office, establishment of the element, procurement/acquisition strategy, and the day-to-day operation of the office.

From May 2010 to October 2011, he served in the temporary SES position of manager of the External Tank Project Office for the Space Shuttle Program. Under his leadership, the project completed its final phase of operations during a challenging and pivotal period of transition in the agency while bringing the shuttle program to a safe and successful close.

Honeycutt was deputy manager of the External Tank Project from 2006 until 2010. He assisted the project manager in leading the project office and delivering external tanks to the Kennedy Space Center in support of the shuttle program.

In September 2004, he was named NASA lead engineer, responsible for test and certification of all Return to Flight II external tank redesigns. Honeycutt led a team of multi-disciplined engineers who developed design solutions and implemented a disciplined, well-documented and controlled verification and certification process to safely return the external tank to flight.

In September 2000, he was assigned Vehicle Propulsion System lead, responsible for vehicle subsystem propulsion design, analysis, systems integration, test planning, data evaluation, and tool and process development. Honeycutt also was the NASA lead for the External Tank Working Group Interface Team that closed all fault tree blocks associated with external tank interfaces during the space shuttle Columbia accident investigation.

In July 1999, he was assigned lead engineer for the relocation of MC-1 engine testing to Santa Susana Field Laboratories in California. He also was product development team lead for the propulsion test article.

Prior to joining NASA in 1999, Honeycutt was lead test engineer at Boeing North American in Huntsville. From 1997 to 1999, he was an environmental and structural test engineer, responsible for qualification, protoflight and acceptance testing for the International Space Station. He also worked for Rockwell International in Huntsville from 1990 to 1996, providing main propulsion system and external tank engineering analysis and launch support for the shuttle program at the Marshall Center.

Honeycutt has broadened his leadership perspective by participating in several leadership activities, including Marshall's Leadership Development Series, Office of Personnel Management's Leadership Assessment Program, and NASA's Academy of Program/Project and Engineering Leadership. For his service to the space program, he has received numerous



John Honeycutt is the deputy chief engineer for the Space Launch System, managed at the Marshall Space Flight Center. (NASA/MSFC/Emmett Given)

awards, including a NASA Exceptional Achievement Medal, a Space Flight Awareness Award, a Silver Snoopy Award, a Center Director's Commendation and numerous group achievement awards.

A native of Huntsville, he graduated in 1990 from the University of Alabama in Huntsville with a bachelor's degree in mechanical engineering.

Honeycutt is married to the former Terri Johnson, also originally from Huntsville. They have one son and live in Huntsville.

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### **Singer, Songwriter Bill Withers Encourages People with Disabilities be Given a Chance to Shine**



*Bill Withers, right, a singer/songwriter who wrote and performed such music hits as "Ain't No Sunshine" and "Lean on Me," accepts mementos of appreciation from Marshall Space Flight Center Director Patrick Scheuermann after delivering a meaningful -- and humorous -- speech at the center's Disability Employment Awareness Month program Oct. 11. Withers talked about his own struggles with a speech impediment throughout his life, and the importance of not underestimating the capabilities of people with mental and physical disabilities. "Remember, they have gifts that we don't have," Withers said. National Disability Employment Awareness Month is held each*

*October to raise awareness about disability employment issues and celebrates the many and varied contributions of America's workers with disabilities. (NASA/MSFC/Emmett Given)*

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### **Chandra Captures Four Planetary Nebulas**

*This gallery shows four planetary nebulas from the first systematic survey of such objects in the solar neighborhood made with NASA's Chandra X-ray Observatory. The planetary nebulas shown here are NGC 6543, also known as the Cat's Eye, NGC 7662, NGC 7009 and NGC 6826. In each case, X-ray emission from Chandra is colored purple and optical emission from the Hubble Space Telescope is colored red, green and blue.*



*In the first part of this survey, published in a new paper published in the August 2012 issue of *The Astronomical Journal*, 21 planetary nebulas within about 5,000 light-years of the Earth have been observed. The paper also includes studies of 14 other planetary nebulas, within the same distance range, that Chandra had already observed.*

*A planetary nebula represents a phase of stellar evolution that the sun should experience several billion years from now. When a star like the sun uses up all of the hydrogen in its core, it expands into a red giant, with a radius that increases by tens to hundreds of times. In this phase, a star sheds most of its outer layers, eventually leaving behind a hot core that will soon contract to form a dense white dwarf star. A fast wind emanating from the hot core rams into the ejected atmosphere, pushes it outward, and creates the graceful, shell-like filamentary structures seen with optical telescopes.*

*The diffuse X-ray emission seen in about 30 percent of the planetary nebulas in the new Chandra survey, and all members of the gallery, is caused by shock waves as the fast wind collides with the ejected atmosphere. The new survey data reveal that the optical images of most planetary nebulas with diffuse X-ray emission display compact shells with sharp rims, surrounded by fainter halos. All of these compact shells have observed ages that are less than about 5,000 years, which therefore likely represents the timescale for the strong shock waves to occur.*

*About half of the planetary nebulas in the study show X-ray point sources in the center, and all but one of these point sources show high-energy X-rays that may be caused by a companion star, suggesting that a high frequency of central stars responsible for ejecting planetary nebulas have companions. Future studies should help clarify the role of double stars in determining the structure and evolution of planetary nebulas.*

*The first two authors of the paper in *The Astronomical Journal* are Joel Kastner and Rodolfo Montez Jr. of the Rochester Institute of Technology in New York, accompanied by 23 co-authors.*

*The Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass. (X-ray: NASA/CXC/RIT/J.Kastner et al.; Optical: NASA/STScI)*

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On Oct. 23, Tom Kibble, professor emeritus at Imperial College London, will present a historical account of the developments leading up to the unification of weak and electromagnetic interactions, as seen from his viewpoint.

The presentation, titled Genesis of the Higgs Boson and Electroweak Symmetry Breaking, is part of the Distinguished Lecturer Series that is co-sponsored by NASA, the University of Alabama in Huntsville, and the National Space Science and Technology Center.

The event will be held at UAHuntsville's Chan Auditorium in the Administrative Science Building on Ben Graves Drive at 2:30 p.m. All Marshall Space Flight Center team members are invited to attend.

For more information, team members can visit [here](#).

**Find this article at:**

<http://www.nasa.gov/centers/marshall/about/star/index.html>



Tom Kibble (Imperial College London website)